

Sample Space for Rolling 2 Dice of the Same Colors or rolling 1 die twice.

Roll 2 dice	1		2		3		4		5		6	
1	1	1	1	2	1	3	1	4	1	5	1	6
2	2	1	2	2	2	3	2	4	2	5	2	6
3	3	1	3	2	3	3	3	4	3	5	3	6
4	4	1	4	2	4	3	4	4	4	5	4	6
5	5	1	5	2	5	3	5	4	5	5	5	6
6	6	1	6	2	6	3	6	4	6	5	6	6

$$P(2, 2) = \frac{1}{36}, P(6, 1) = \frac{1}{36}, P(\text{sum of 7}) = \frac{6}{36}, P(\text{less than 7}) = \frac{15}{36}$$

### Compound Events

#### **Independent Events**

Two events are independent if the occurrence of one does not affect the probability of the occurrence of the other.

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

*“with replacement” indicates independent*

$$P(2, 2) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}, P(6, 1) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$$

#### **Dependent Events**

Two events are dependent if the occurrence of one affects the probability of the other.

$$P(A \text{ and } B) = P(A) \cdot P(B|A)$$

$$P(B|A) = P(B \text{ after } A \text{ occurs})$$

*“without replacement” indicates dependent*

*“removal or set aside” indicates dependent*

*“Kept”*

## Comparing the Solutions to Theoretical Probability & Independent Probability Examples

Roll 2 dice	1		2		3		4		5		6	
1	1	1	1	2	1	3	1	4	1	5	1	6
2	2	1	2	2	2	3	2	4	2	5	2	6
3	3	1	3	2	3	3	3	4	3	5	3	6
4	4	1	4	2	4	3	4	4	4	5	4	6
5	5	1	5	2	5	3	5	4	5	5	5	6
6	6	1	6	2	6	3	6	4	6	5	6	6

Sample Space for Rolling 2 Dice of Different Colors

See Textbook **Example #1** Pg 669:

**Rolling a green and a red die together or at once. What is the probability that the red one is odd and the green one is greater than or equal to 5?**

**Solution A (Theoretical Probability of *equally likely events*).**

Find the sample space and **Highlight** the number of *favorable outcomes*, which is 6. There are 36 *possible* outcomes.

Roll 2 dice	1		2		3		4		5		6	
1	1	1	1	2	1	3	1	4	1	5	1	6
2	2	1	2	2	2	3	2	4	2	5	2	6
3	3	1	3	2	3	3	3	4	3	5	3	6
4	4	1	4	2	4	3	4	4	4	5	4	6
5	5	1	5	2	5	3	5	4	5	5	5	6
6	6	1	6	2	6	3	6	4	6	5	6	6

$$P(\text{Red Odd AND Green } \geq 5) = \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}} = \frac{6}{36} = \frac{1}{6}$$

**Solution B. (Independent Events)**

$$P(\text{Red Odd AND Green } \geq 5) = P(\text{ROdd}) \cdot P(G \geq 5) = \frac{3}{6} \cdot \frac{2}{6} = \frac{6}{36} = \frac{1}{6}$$

# of Red Odd is 3                      # pf Green  $\geq 5$  is 2

*The comparison, finding the sample space may take some time as in this case. Determine if it is independent and then find the individual probabilities and multiply them together.*